Chapter Forty-two

BICYCLE FACILITIES

BUREAU OF LOCAL ROADS AND STREETS MANUAL

Chapter Forty-two
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42-1 POLICIES

A local agency should consider the travel needs of all users of a transportation corridor when planning transportation improvements. Bicycle facilities must be considered on all Federal-aid projects and should also be considered on MFT projects, where practical.

See the checklist provided in Section 42-2 for help in deciding if bicycle facilities are needed. If it is determined that the volume and character of existing and potential bicycle travel in the vicinity of a project justify the provision of bicycle facilities, provide the appropriate accommodations as discussed in Section 42-3.

Base the provision of bicycle facilities on anticipated demand and traffic safety considerations. The following guidelines may be used in considering the need for bicycle facilities:

1. The highway or street is designated as a bikeway on a regionally or locally adopted bike plan or published in a regional or locally adopted map as a recommended bike route.

2. The projected two-way bicycle traffic volume is 25 ADT or greater during the peak 3 months of the bicycling season on a highway or street where the current vehicular traffic exceeds 1000 ADT. Project the future bicycle ADT 5 years from the completion of the project.

3. The route provides primary access to a park, recreational area, school, or other significant destination.

4. The route provides unique access across a natural or man-made barrier (e.g., bridges over rivers, roadways, railroads) or under access-controlled facilities and roadways.

5. The highway project negatively affects the recreational or transportation utility of an independent bike lane or trail. Typically, highway projects negatively affect at-grade paths and trails where they are severed. This happens when the projected roadway traffic volumes increase to a level that prevents safe crossings, or where the widening of the roadway increases crossing time to a level that would make a crossing unsafe.

6. Provisions may also be necessary to safely accommodate bicycle traffic on highways where bridge decks are being replaced or rehabilitated.

42-2 CHECKLIST FOR BICYCLE ACCOMMODATION

Include a checklist in the Project Development Reports for Federal projects where the evaluation of the potential for bicycle accommodations is necessary. Where provisions for adequate bicycle accommodations are already designed for in a project, provide a descriptive statement regarding the bicycle accommodations in lieu of a checklist. A checklist may also be used as a guide for bicycle accommodations on projects constructed with other funds.

42-2.01 Bicycle Travel Generators in the Project Vicinity

Potential bicycle travel generators in the vicinity of a project should be reviewed and recorded. A checklist of the potential bicycle travel generators is provided in Figure 42-2A. Record the types of generators within 1.2 miles (2 km) of the project corridor. Attach a map of this area showing these generators. An example project location map is provided in Figure 42-2B. Sections of municipal or township maps are acceptable, as well as photocopies of aerial photos. Indicate where bicyclists will cross or ride along the corridor on the map. Also, indicate the absence of any of these types of destinations; therefore, providing the justification for the exclusion of accommodations for bicycle travel.

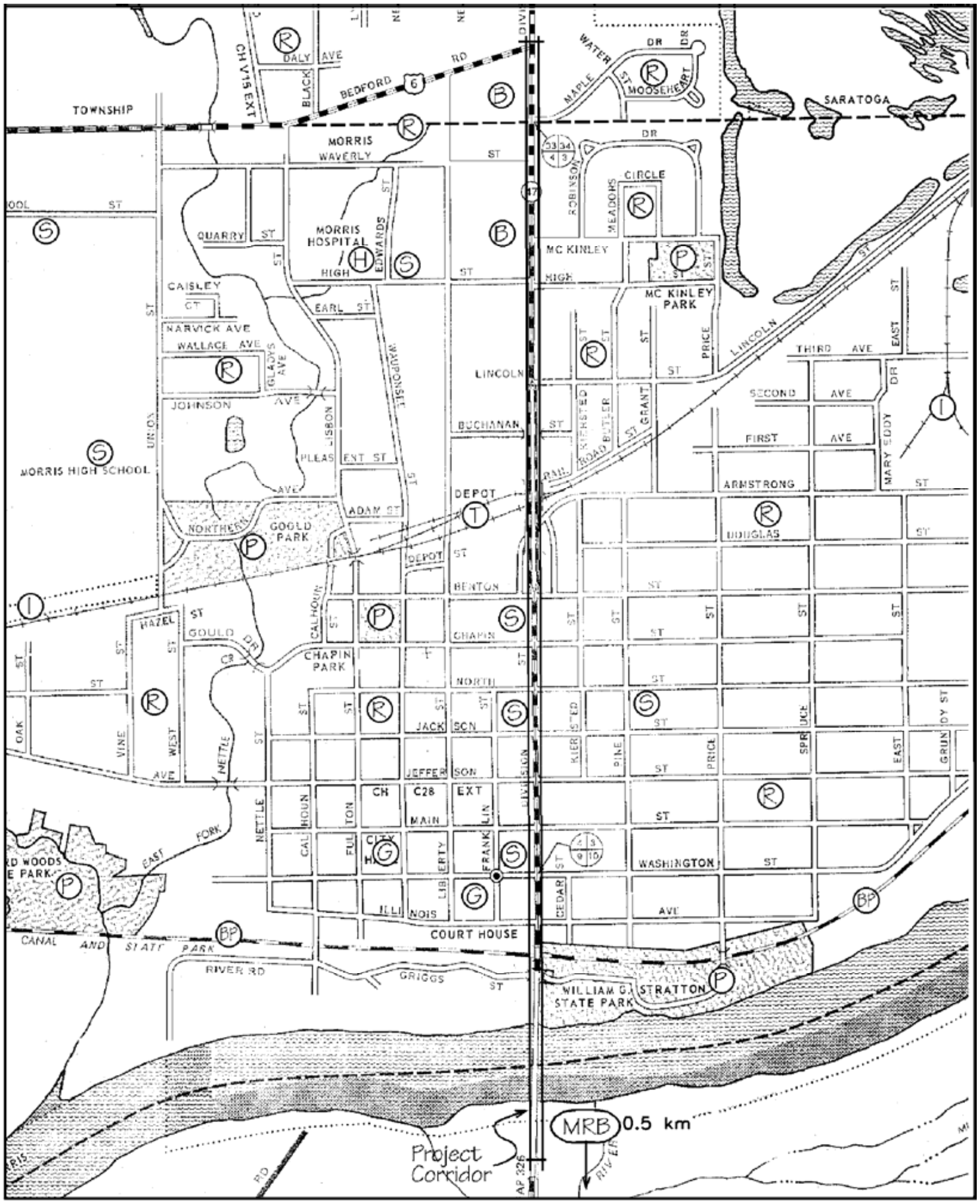
Generators	**Yes**	**No**	**Generators**	**Yes**	**No**
Residential areas	☐	☐	Shopping centers	☐	☐
Parks	☐	☐	Hospitals	☐	☐
Recreation areas	☐	☐	Employment centers	☐	☐
Churches	☐	☐	Government offices	☐	☐
Schools	☐	☐	Local businesses	☐	☐
Libraries	☐	☐	Industrial plants	☐	☐
Existing bicycle trails	☐	☐	Public transportation facilities	☐	☐
Planned bicycle trails	☐	☐	Other ___________________	☐	☐

BICYCLE TRAVEL GENERATORS

Figure 42-2A

42-2.02 Public Coordination

Use a checklist similar to the checklist provided in Figure 42-2C to note whether those organizations have been contacted to assess nearby bicycle travel or planned development of recreational trails or other bicycle travel generators. Include documentation of these written contacts and all applicable replies in the Project Development Reports.



R	Residential	BP	Existing Bicycle Trails	G	Government Offices
P	Parks	PBP	Planned Bicycle Trails	B	Local Businesses
P	Recreational Areas	M	Shopping Centers	I	Industrial Plants
C	Churches	H	Hospitals	T	Public Transit Facilities
S	Schools	E	Employment Centers		

EXAMPLE OF MAP TO ACCOMPANY CHECKLIST FOR BICYCLE TRAVEL

Figure 42-2B

Organization	Yes	No	Organization	Yes	No
Metropolitan planning organization (if applicable)	☐	☐	League of Illinois Bicyclists	☐	☐
Local municipalities	☐	☐	Illinois Department of Natural Resources	☐	☐
Park or forest preserve districts	☐	☐	Illinois Trails Conservancy	☐	☐

PUBLIC COORDINATION CHECKLIST

Figure 42-2C

42-2.03 Assessment of Bicycle Travel

Based on the indicators discussed in Section 42-2.01 and 42-2.02, attach additional information, if appropriate. Use the following questions as a basis for including additional information.

1. Where would bicyclists cross the project? ______________________________
____
____

2. Where would bicyclists need to ride parallel to the project? ______________________________
____
____

3. Does the project provide unique or primary access: [1]

- Across a river, railroad, highway corridor, or other natural or man-made barrier? ________
____
____
____

- Into or out of a residential or commercial development? ______________________________
____
____

- Between communities or other likely significant destinations (e.g., a university campus, recreation facility)? ______________________________
____
____

[1] Unique or primary access is defined as access not otherwise available within a reasonable riding distance of 1.2 mi (2 km).

4. Are there any secondary roads parallel to the project that could reasonably be used by cyclists as alternatives to access these destinations?[2] ______________________________
____
____

If so, how far from the corridor are these roads? (A key consideration with parallel roads is whether there are significant destinations located <u>on</u> the project corridor that bicyclists would need to access.) ______________________________________
____
____

5. Do local government entities or other organizations have plans for bicycle facilities or generators (e.g., park or recreational area) that could affect this project or generate additional travel in the project corridor? ______________________________
____
____

[2] Secondary roads that could be used as alternative routes are usually within 2-3 blocks of projects in urban areas, 0.5 mi (1 km) in suburban areas and 1.2 mi (2 km) in rural areas.

42-3 DESIGN GUIDELINES

Use the current edition of AASHTO's *Guide for the Development of Bicycle Facilities* as the primary source for planning and design guidance.

42-3.01 Definitions

1. Bicycle. Every vehicle propelled solely by human power upon which any person may ride, having two tandem wheels, except scooters and similar devices. The term "bicycle" in the context of this Chapter also refers to three- and four-wheeled human-powered vehicles, but not children's tricycles.

2. Bicycle Facilities. A broad term that includes bike lanes, shared roadways, shoulders (which may be used by bicyclists), traffic control devices, shelters, and parking facilities for bicycles.

3. Bicycle Lane (Bike Lane). A portion of a roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

4. Bicycle Path (Bike Path). A bike lane physically separate from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way.

5. Bicycle Route (Bike Route). A segment within a system of bikeways designated by the agency having jurisdiction of the facility with appropriate directional and informational markers, with or without a specific bicycle route number.

6. Bikeway. Any road or street, path, or travelway, which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

7. Independent Bicycle Construction Project (Independent Bicycle Project). A project designation used to distinguish a bicycle facility constructed independently and primarily for use by bicyclists from an improvement included as an incidental part of a highway construction project.

8. Incidental Bicycle or Pedestrian Walkway Construction Project (Incidental Feature). One constructed as an incidental part of a highway construction project.

9. Rail-Trail. A shared use path, either paved or unpaved, built within the right-of-way of an existing or former railroad.

10. Recreational Use. The primary function of the facility is for pleasure, exercise, etc.

11. Shared Roadway. A roadway open to both bicycle and motor vehicle travel. This may be an existing roadway, a street with wide curb lanes, or a road with paved shoulders. A shared roadway could be signed or not signed. There are no pavement markings for a separate bike lane.

12. Shared Use Path. A facility physically separate from motorized vehicular traffic by an open space or barrier, and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. This would exclude horses and other animals, as well as animal-drawn conveyances.

13. Signed Bike Route. A shared roadway, bike lane, or separate path that has been designated by signing as a preferred route for bicycle use.

14. Transportation Use. The primary function of the facility is for travel from an origin to a destination.

15. Traveled Way. The portion of the roadway for the movement of vehicles, exclusive of shoulders.

42-3.02 Separated (Shared Use Paths) Bicycle Paths

The principles for geometric design of bike paths are the same as those used in general highway design. While exclusive bicycle use of a bicycle path is often ideal, it seldom occurs. For this reason, pedestrian, in-line skaters, and other anticipated use is always considered in the design of the facility. Include separate areas to minimize the conflicts arising from the different speeds of these transportation modes, where practical. This Section provides guidance specific to the design of bike paths. Also, see the AASHTO *Guide for the Development of Bicycle Facilities* for more detailed information.

42-3.02(a) Bike Paths Versus Sidewalks

Sidewalks are generally not suitable for bicycle travel, primarily because of their narrow width and multiple opportunities for conflicts with driveways and commercial entrances. Some suburban sidewalks; however, may be preferable to on-road accommodations, particularly if they provide adequate width, and are located on both sides of the roadway.

42-3.02(b) Width

Widths for shared use bicycle paths will vary in accordance with the conditions illustrated in Figure 42-3A. Figure 42-3B illustrates the minimum cross sections for two-way, shared-use paths.

42-3.02(c) Surface Type

Bituminous pavement surfaces are preferred over those of crushed aggregate because aggregate materials provide a much lower level of service and require substantially increased maintenance over the life of the project. Concrete may offer advantages in wet soil conditions or in areas that may periodically flood.

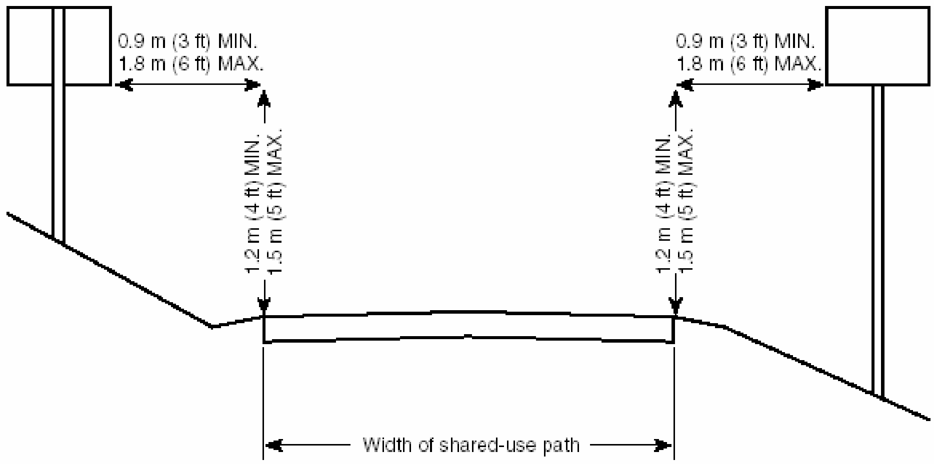
ANTICIPATED VOLUME	ONE-WAY(1)(2)(3)(4)	TWO-WAY(2)(3)(4)
< 100 Users per Peak Hour	5 ft (1.5 m)(5)	8 ft (2.4 m)(5)
100 - 300 Users per Peak Hour	6 ft (1.8 m)	10 ft (3.0 m)
> 300 Users per Peak Hour	7 ft (2.1 m)	12 ft (3.6 m)(6)

Notes:

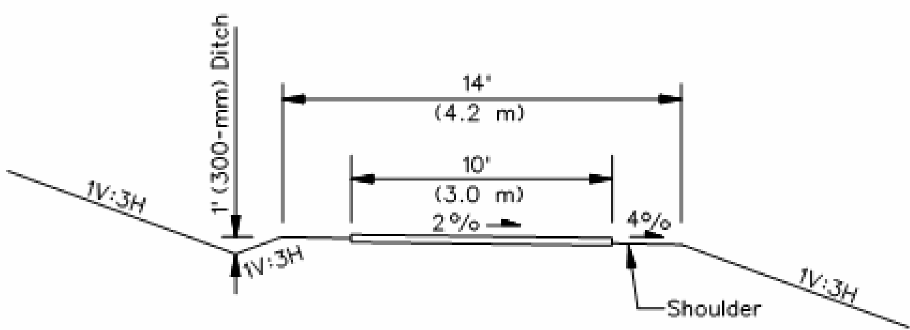
1. *It should be recognized that one-way bicycle paths will often be used as two-way facilities unless effective measures are taken to ensure one-way operation. Without such enforcement, it should be assumed that bicycle paths will be used as two-way facilities and designed accordingly.*
2. *Provide a minimum 2 ft (600 mm) wide graded turf or gravel area to both sides of the pavement.*
3. *Desirably, provide a 3 ft (900 mm) or more clear area on each side to trees, poles, walls, fences, guardrails, and other lateral obstructions.*
4. *If signs are installed along the bicycle path, provide a minimum 3 ft (900 mm) to a maximum 6 ft (1.8 m) clear area from the edge of path.*
5. *Use the 5 ft (1.5 m) and 8 ft (2.4 m) width only at locations where there will be low usage, few conflicts among users, good horizontal and vertical alignment providing for safe and frequent passing opportunities, minimal maintenance vehicle traffic which would cause pavement edge damage, and/or right-of-way constraints or physical barriers.*
6. *Where usage exceeds 300 users per hour during the peak periods of usage, separating bicycle and pedestrian travel may be considered. Stripe 4 ft (1.2 m) bike lanes in each direction and a 4 ft (1.2 m) width for pedestrians, as shown in Figure 42-3B. Also, consider constructing a separated pathway for pedestrians.*

SHARED-USE BICYCLE PATH WIDTHS

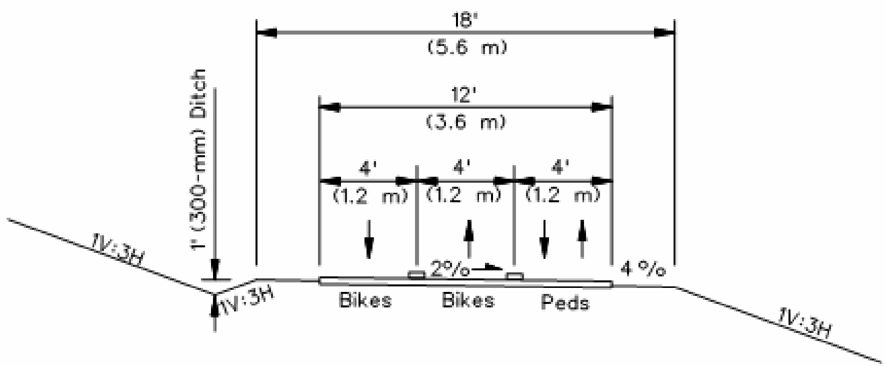
Figure 42-3A



TYPICAL SIGN PLACEMENT FOR SHARED USE PATH



TYPICAL SHARED USE PATH FOR AVERAGE SHARED USE



TYPICAL SHARED USE PATH FOR SUBSTANTIAL SHARED USE
(More Than 300 Users in Peak Hour, Striping is Optional)

TYPICAL CROSS SECTIONS FOR TWO-WAY, SHARED-USE BICYCLE PATHS

Figure 42-3B

In some situations, a bituminous surface treatment (e.g., A1/A2/A3) of an aggregate surface may be adequate for bike paths, considering the limitations of the surface (e.g., bleeding oil on hot summer days).

Crushed aggregate surfaces, while not encouraged because of high maintenance, can provide an adequate surface if prepared properly and routinely maintained. The subgrade should be properly compacted and a geotextile fabric mat used if the soil is soft or unstable. Crushed aggregate surface course (i.e., FA 20 or equivalent) should be placed over a base course and properly rolled and compacted.

Figure 42-3C provides information regarding the advantages and disadvantages of various bike path surfaces.

42-3.02(d) Separation

Where a two-way bike path is physically located within the highway right-of-way, it must be separated horizontally from motorized traffic. An example is shown in Figure 42-3D. For rural sections, the bike path must be located off the shoulder. This separation should be as wide as practical and still allow the bicyclist to be visible by the motorist, but not less than 5 ft (1.5 m). Where bike lanes cannot be located at least 5 ft (1.5 m) from the edge of pavement (rural) or from face of curb (urban), provide a 3.5 ft (1.1 m) high barrier.

42-3.02(e) Design Speed

Bicycle paths should be designed for a selected speed that is at least as high as the preferred speed of the faster bicyclists. In general, use a minimum design speed of 20 mph (30 km/h). However, where the grade exceeds 4.0% or where strong prevailing tail winds exit (e.g., along a lake or river), a design speed of 30 mph (50 km/h) is advisable.

On unpaved paths, where bicyclists tend to ride slower, use a lower design speed of 15 mph (25 km/h). Similarly, where the grades or the prevailing winds dictate, a higher design speed of 25 mph (40 km/h) may be considered.

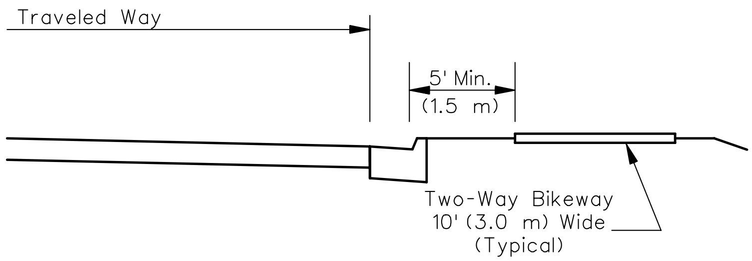
42-3.02(f) Horizontal Alignment

Unlike an automobile, a bicycle must be leaned while cornering to prevent it from falling outward due to the centrifugal force. The balance of centrifugal force due to cornering, and the bicycle’s downward force due to its mass, act through the bicycle and operator’s combined center of mass which intersects a line that connects the front and rear tire contact points.

SURFACE MATERIAL	ADVANTAGES	DISADVANTAGES
Crushed Aggregate	Soft but firm surface; natural material; moderate cost; rough surface; accommodates some multi-use.	Surface can rut or erode from heavy rainfall; surface softens when set - bike tires, horses will damage surface; regular maintenance to keep consistent surface; replenishing aggregate may be a long-term expense; not for slopes > 3.0%.
Bituminous Surface Treatment (also called Oil & Chip, Chip Seal)	Inexpensive to apply; more stable surface, durable.	Potential for oil bleeding to surface in hot weather, application methods important to minimize loose gravel.
Asphalt	Hard surface; supports most types of use; all weather; does not erode; accommodates most users simultaneously; low maintenance.	Higher installation costs; more costly to repair; not a natural surface; freeze/thaw can crack surface; heavy construction vehicles need access.
Concrete	Hardest surface; easy to form to site conditions; supports multiple use; lowest maintenance; resists freeze/thaw; best cold weather surface; best for wet conditions.	High installation cost; costly to repair; not a natural looking surface; construction vehicles will need access to the trail corridor.

BIKE PATH TRAIL SURFACES

Figure 42-3C



MINIMUM SEPARATION OF BICYCLE PATH FROM ROADWAY

Figure 42-3D

Consider the following factors when determining horizontal curves:

1. Lean Angle. The bicyclist leans when traveling through horizontal curves to counteract centrifugal forces tending to cause the bicycle/operator to fall outward. If the bicyclist pedals through the curve at a lean angle of 25°, the inside pedal generally strikes the ground during the downstroke. As a result, the typical maximum lean angle should be considered to be 15°-20°. Figure 42-3E presents minimum radii for horizontal curves where lean angles up to 15° are appropriate and the bike path is paved. For leans up to 20°, see Section 17-2 of the *BDE Manual*.

2. Cross Slope/Superelevation. Most shared use paths will be required to meet the requirements of the *Americans with Disabilities Act* (ADA). *ADA Accessibility Guidelines* call for a pavement cross slope no greater than 2.0% in order to accommodate wheelchair use. The limiting rate of superelevation on the bike path is therefore 2.0%.

3. Lateral Clearance. Bicyclists tend to ride near the middle of the bike path when the path is narrow and tend to ride side-by-side when in groups of two or more. This increases the likelihood of head-on collisions. Account for this in the design by calculating lateral clearances on horizontal curves based on the sum of the stopping sight distances for bicyclists traveling in opposite directions. If this is impractical, consider widening the path through the curve, installing a centerline stripe, or installing “Curve Ahead” warning signs in accordance with the *ILMUTCD*.

DESIGN SPEED (V)		MINIMUM RADIUS (R_{min})	
mph	**km/h**	**ft**	**m**
15	20	55	12
20	30	100	27
25	40	155	47
30	50	225	74

MINIMUM RADIUS FOR PAVED PATHS BASED ON 15° LEAN ANGLE

Figure 42-3E

42-3.02(g) Vertical Alignment

Consider the following when determining vertical alignment:

1. <u>Grades</u>. Minimize grades on bicycle paths to the extent practical, especially near intersections. Grades in excess of 5.0% are undesirable; the ascent is difficult for most bicyclists and the descent may result in speeds that exceed the comfort level or competence of the rider. It may be necessary, however, to exceed the 5.0% limit along some sections of bike paths due to terrain or right-of-way restrictions. See Figure 42-3F for restrictions on grade length:

Longitudinal Grade	Maximum Length
5%-6%	800 ft (240 m)
7%	400 ft (120 m)
8%	300 ft (90 m)
9%	200 ft (60 m)
10%	100 ft (30 m)
11+%	50 ft (15 m)

MAXIMUM GRADE LENGTHS FOR BIKE PATH GRADES IN EXCESS OF 5.0%

Figure 42-3F

Grades in excess of 3.0% need to be evaluated concerning the need for *ADA* compliance. In addition, grades in excess of 3.0% are impractical for unpaved paths because of increased erosion potential. Mitigate excessive grades using the following options:

- Provide additional width to permit slower bicyclists to dismount and walk.
- Provide signing alerting bicyclists to the maximum percent of grade, per the *ILMUTCD.*
- Post a recommended descent speed.

- Provide stopping sight distances that exceed the minimums.
- Provide horizontal clearances that exceed the minimums.
- Widen the path or include short switchbacks to contain the speed of descending bicyclists.
- Provide extra shoulder width for riders to dismount and rest.

2. Sight Distance. For sight distance calculations, assume the bicyclist's combined perception and brake reaction time is 2.5 seconds. The height of eye for a bicyclist is 4.5 ft (1.4 m) and the height of object is 0.0 ft (0.0 m). The coefficient of friction between tire and pavement is 0.25 for wet-weather braking conditions. Use the following equations to determine the applicable sight distance for bicycle paths:

$$S = \frac{V^2}{30\left(f \pm G\right)} + 3.67V$$ Equation 42-3.1 (US Customary)

$$S = \frac{V^2}{254\left(f \pm G\right)} + \frac{V}{1.4}$$ Equation (42-3.1 Metric)

Where:

S = stopping sight distance, ft (m)
V = velocity, mph (km/h)
f = coefficient of friction (use 0.25)
G = grade, ft/ft (m/m) (rise/run)

3. Vertical Curve Lengths. Using the sight distance data and Equation 42-3.1, determine the vertical curve lengths. Use the following equations:

$$L = \frac{AS^2}{200\left(\sqrt{h_1}+\sqrt{h_2}\right)^2}$$ (Equation 42-3.2)

$$L = KA$$ (Equation 42-3.3)

Where:

L = length of vertical curve, ft (m)
A = algebraic difference between the two tangent grades, %
S = sight distance, ft (m)
h_1 = height of eye above road surface, ft (m)
h_2 = height of object above road surface, ft (m)
K = horizontal distance needed to produce a 1.0% change in gradient, ft/% (m/%)

42-3.02(h) Bike Path Structures

The following criteria apply to structures for bike paths:

1. Width. The minimum clear width for a new bike path structure is the same width as the approach paved bicycle path. The desirable clear width also includes the minimum 2 ft (600 mm) shoulders. The overall width may be governed by access requirements for emergency, patrol, and maintenance vehicles.

2. Railings. Railings, fences, or barriers on both sides of a bicycle path structure should be a minimum of 4.5 ft (1.4 m) high. Smooth rub rails should be attached to the barriers at handlebar height of 3.5 ft (1.1 m).

3. Vertical Clearances. A minimum vertical clearance of 8 ft (2.4 m) should be provided for the bike path. However, vertical clearance may need to be greater to permit passage of maintenance vehicles, rescue vehicles, and ambulances. Rescue vehicles typically can exceed 9 ft (2.7 m) in width. Wherever practical, a vertical clearance of 10 ft (3.0 m) is desirable. Where the bike path crosses over highways or railroads, provide a minimum vertical clearance of 17 ft-3 in (5.3 m) over highways and 23 ft-0 in (7.0 m) over railroads. A variance for a vertical clearance over a highway will only be considered under extreme conditions where the bridge is located in an urban area.

4. Tunnels. The design of bike lane tunnels should follow the same guidance for size and overhead clearance, as discussed in Section 17-2 of the *BDE Manual*, with recognition of the types of traffic that need to be accommodated (e.g., emergency vehicles). With tunnels or box culverts exceeding 100 ft (30 m) in length, the users' sense of security is enhanced with larger openings (i.e., minimum 10 ft (3 m) high and 14 ft (4.2 m) wide). The alignment of the approaching path should provide a clear view through the structure, where practical. On long structures (e.g., under multilane highways), a shaft opening at the median can provide natural light and ventilation. Lighting should be considered in areas where security is a concern. Where bike lanes are routed under highway bridges, drainage from the bridge above should be routed to drain away from the path surface.

5. Additional Guidance. The AASHTO *Guide Specification for Design of Pedestrian Bridges* and the AASHTO *Standard Specifications for Highway Bridges* provides additional information applicable to the design of bike path structures.

42-3.02(i) Bike Paths/Highway Crossings

It is preferable that the crossing of a bicycle path and a highway be at a location significantly away from the influence of intersections with other highways.

If adequate gaps in vehicular traffic are not available, some form of crossing control is generally required. This can include flashing lights, signals, or a grade separation. The *ILMUTCD* provides guidance on proper marking and signage. Also, consider re-routing the path to a nearby signalized intersection. However, any use of re-routing that causes excessive redundant travel may be perceived as a barrier and should not be used. At crossings of high-volume, multilane arterial highways where a signal or a grade separation is not provided, consider providing a median refuge area for bicyclists.

Designers should use engineering judgment to decide where these types of safety measures are necessary and cost-effective by considering traffic volumes, motor vehicle speeds, and anticipated usage.

For additional guidance, see Section 17-2 of the *BDE Manual*.

42-3.03 <u>Accommodating On-Road Bicycle Travel</u>

42-3.03(a) Rural Bicycle Facilities

Bicycle accommodation on rural cross sections consists of paving a portion of the shoulder. In addition to the benefits to the bicyclist, paved shoulders offer added safety, reduced maintenance, and a hard surface off the traveled way for mail delivery vehicles.

Paved shoulders marked as bike lanes should be smooth and maintained to provide a desirable riding surface. Provide minimum shoulder widths of 4 ft (1.2 m) where they are intended for bicycle travel. Additional width may be necessary in locations where vehicular speeds are in excess of 45 mph (70 km/h) or where there are a significant number of trucks and recreational vehicles. Additional width may also be necessary if fixed objects (e.g., traffic signs) are located too close to the bicycle facility. Provide pavement markings if part of the shoulder is designated exclusively for bicycle use. Barriers are required where a bicyclist could fall over obstacles such as guardrails.

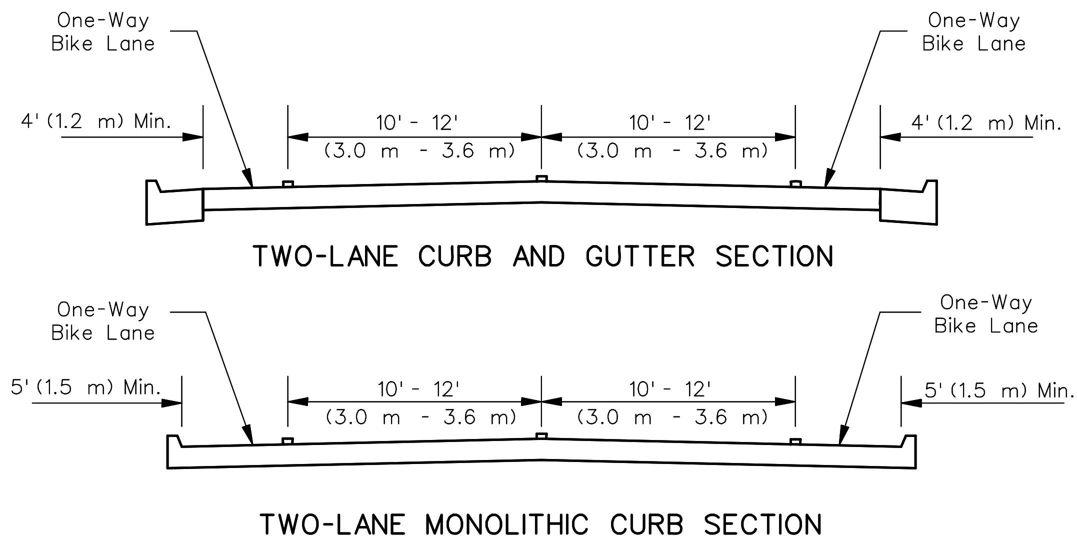
Under normal circumstances, roads with shoulders less than 4 ft (1.2 m) wide should not be signed as bikeways.

42-3.03(b) Urban Bicycle Facilities

On-road urban bicycle facilities generally consist of the following:

1. <u>Marked Bicycle Lanes.</u> Bicycle lanes marked on curbed streets serve to separate bicycle traffic from motor vehicle traffic. They are always one-way facilities carrying traffic in the same direction as adjacent motor vehicle traffic. The following are minimum cross-section requirements:

    a. <u>Curbed Streets Without Parking</u>. The bicycle lane should be located next to the gutter. Provide a minimum lane width of 4 ft (1.2 m) adjacent to the curb and gutter, not including the width of the gutter flag, and 5 ft (1.5 m) adjacent to monolithic curbs; see Figure 42-3G.



MINIMUM CROSS SECTIONS FOR CURBED STREETS WITHOUT PARKING
(Marked Bicycle Lanes)

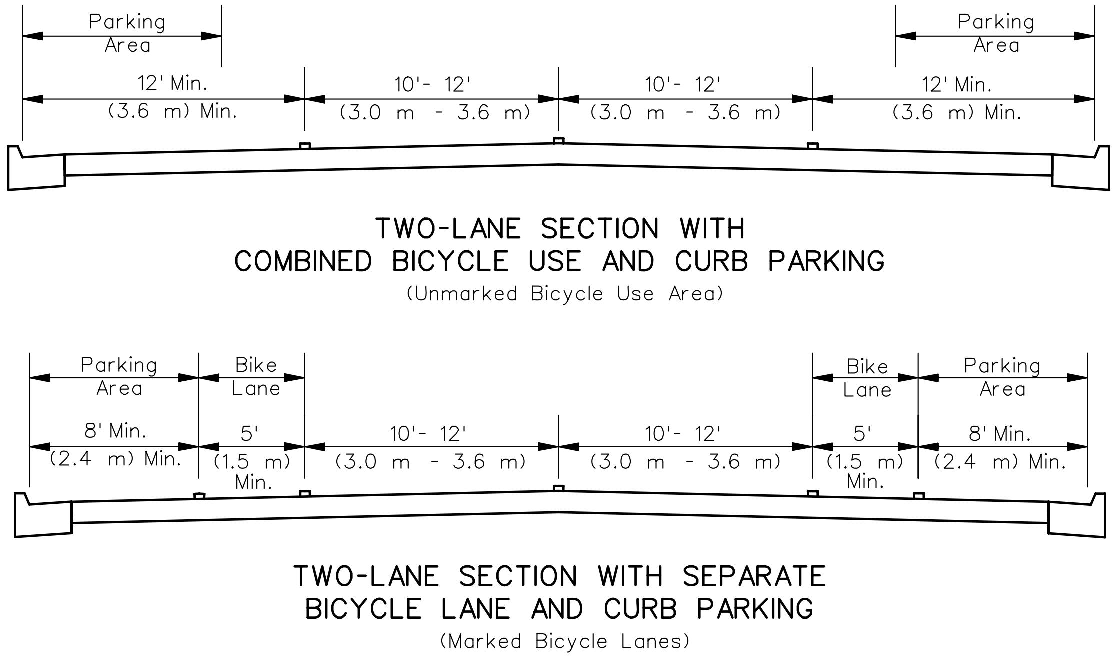
Figure 42-3G

b. Curbed Streets with Parking. The bicycle lane should be located between the parking lane and the through traffic lane with a minimum bicycle lane width of 5 ft (1.5 m); see Figure 42-3H.

2. Shared Roadways. On a shared roadway facility, bicyclists and motorists share the same travel lanes without a striped separation. The majority of urban cross sections fall into this category. Shared roadways have particular application where physical constraints (e.g., buildings, narrow sidewalks, environmentally sensitive areas) preclude widening a street to provide bike lanes.

   Most shared roadways are unmarked, allowing bicyclists to share the outside lane with motor vehicles, as allowed by the *Illinois Compiled Statutes*. In some instances, it may be advantageous to sign some urban and rural roadways as bicycle routes when providing continuity to other bicycle facilities or when establishing a touring route.

   On streets where parking is prohibited, the recommended lane width on two-lane, two-way roadways is 14 ft (4.2 m) excluding gutter flags. However, a width of 13 ft (4.0 m) may be considered acceptable. Use these same widths for the outer lanes of multilane highways where bicycle traffic is allowed.



MINIMUM CROSS SECTIONS FOR CURBED STREETS WITH PARKING

Figure 42-3H

Where parallel curb parking is permitted but a parking lane is not provided, the combination curb lane should be a minimum of 12 ft (3.6 m) wide. If parking volume is substantial or turnover is high, an additional 1 ft or 2 ft (300 mm or 600 mm) of width is desirable.

42-3.03(c) Accommodation on Existing Roads and Streets

Bicycle accommodations can also be adapted to a roadway by marking or remarking the pavement to increase the width of the curb lane or to add bike lanes. Consider the following:

- reduce the width of inside traffic lanes;
- reduce median width, especially with the removal of raised-curb medians;
- remove parking possibly in conjunction with providing off-street parking; and/or
- reduce the number of traffic lanes. This option may be appropriate if, for example, one-way couples are created or if a parallel roadway improvement reduces the traffic demand on an adjacent street that is more suited for bicycle travel.

42-3.03(d) Bike Lanes on Highway Structures

Maintain a consistent bicycle lane width from the approach roadway across the structure. New highway structures should, at a minimum, equal the width of the approach roadway plus the width of approaching bicycle lanes and/or sidewalks. The bike lane should have a minimum width of 5 ft (1.5 m). Consider the possible need for future bicycle lanes when planning a new structure. Minimum cross sections for shared roadway, bicycle lanes, and bicycle paths are shown in Figure 42-3I.

Where it is necessary to include a separated bicycle path onto a highway bridge, several alternatives should be considered in light of what the geometrics of the bridge will allow. One option is to carry the bicycle path across one side of the structure. This should be considered where:

- the bridge facility will connect to a bicycle path at both ends,
- sufficient width exists on that side of the bridge or can be obtained by widening or restriping lanes, and
- provisions are made to physically separate bicycle traffic from motor vehicle traffic.

Another option is to use existing sidewalks as one-way or two-way facilities. This may be advisable where:

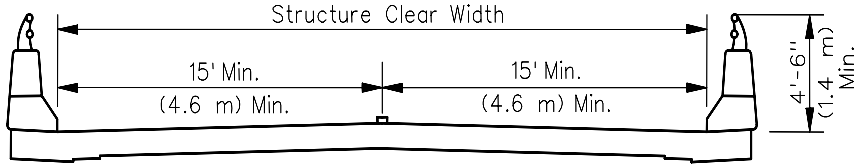
- conflicts between bicyclists and pedestrians will not exceed tolerable limits, and
- the existing sidewalks are adequately wide.

If the facility cannot provide adequate widths, appropriately sign the facility to warn users of the deficiencies or require bicyclists to dismount and cross the structure as a pedestrian. Section 17-2 of the *BDE Manual* provides additional design guidance for structures on bicycle paths. The AASHTO *Standard Specifications for Highway Bridges* specifies a 4.5 ft (1.4 m) outside railing height. Design on-road bicycle accommodations accordingly.

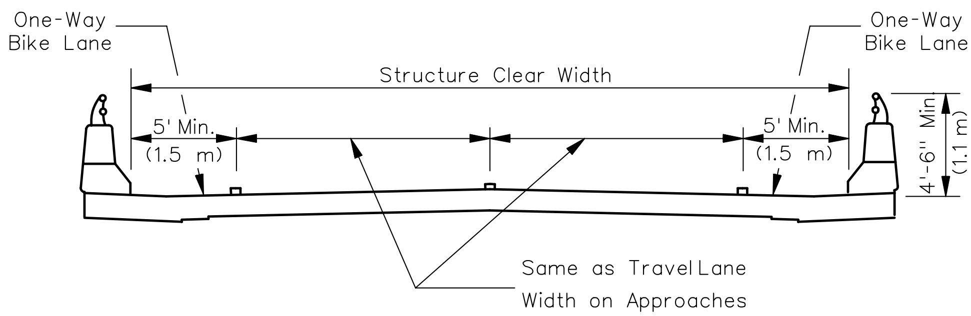
Where bridge projects include bike lane or sidewalk accommodations, the approaches to the structure should ensure a usable facility by continuing the accommodation to logical termini.

42-3.04 <u>Bicycle Railroad Crossings</u>

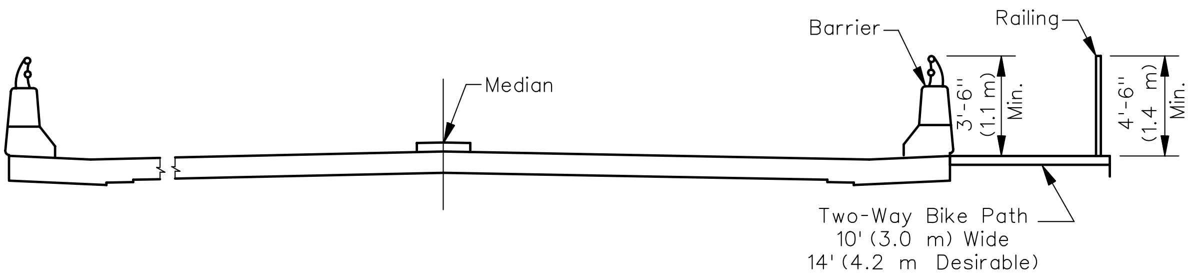
Bike lane and path intersections with the railroad are more sensitive to the skew angle than the main highway because of the possibility of bicycle or wheelchair wheels being trapped in the rail flangeway. It may be possible to modify the horizontal alignment of a bikeway to provide increased crossing safety. Lower design speeds require smaller curve radii, therefore a deviation from the general alignment can be accomplished over a relatively short distance.



WIDE LANES/SHOULDERS CONTINUED ACROSS STRUCTURE



BIKE LANE ACROSS STRUCTURE



ROADWAY SECTION CONTINUED ACROSS
BRIDGE WITH INTEGRAL BIKE PATH

BIKE LANES AND BIKE PATHS ACROSS HIGHWAY BRIDGES

Figure 42-3I

Consider the following to accommodate bicycles across railroads:

1. Width. In general, the normal width of the bikeway, including shoulders, should be maintained through the grade crossing.

2. Vertical Alignment. The vertical alignment considerations that apply to mainline roadways are also applicable to bikeways.

3. Crossing Angle. Bicyclists should be able to cross railroad tracks at or near a right angle to minimize the potential for the bicycle's front wheel to be trapped in the flangeway. Where the crossing angle is less than 45°, consider widening the outside lane, shoulder, or bicycle lane to improve the angle of approach; see Figure 42-3J. Appropriate pavement striping in the widened area can guide users of the bike lane toward the safest alignment across the tracks.

4. Surface. The bicycle portion of the pavement surface should be at the same elevation as the rails. Provide a bicycle-crossing surface that is consistent with the vehicular or bike path-crossing surface.

5. Visibility. Maximum visibility should be provided to improve the cyclist's awareness of approaching trains. Post Railroad Advance Warning signs no less than 50 ft (15 m) in advance of the tracks.

6. Signing and Protection. Crossbuck signs shall be erected at the crossing. All signing should conform to *ILMUTCD*. Flashing light signals should be considered at crossings with a high volume of trains and/or bicycles.

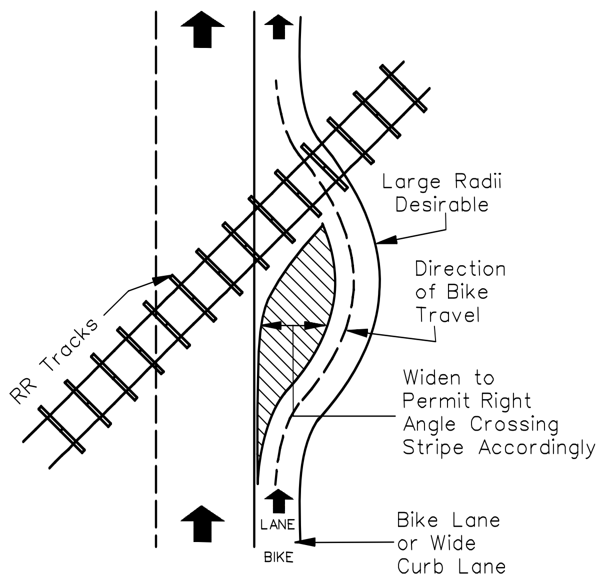
7. Coordination. Contact the railroad early in the development of the project. The ICC may also be involved with bike crossings adjacent to roadways.

42-3.05 Incidental Design Factors

Consider the following additional design factors where applicable to the project.

1. Drainage Grates. Drainage grates and utility covers can be hazardous to bicyclists. All current IDOT drainage grate designs are suitable for bicycle travel. Grates and utility covers located in the cyclist's expected path should be flush with the pavement. With pavement overlay projects, replace utility covers and non-conforming drainage grates and adjust them to be flush with the new surface. A less desirable alternative is to design and construct the pavement to taper into drainage inlets to avoid creating an abrupt edge.

2. Bollards. If bollards are installed across a bike path where it intersects with a street, provide an adequate clear zone between the bollards and the street.



BIKE LANE RAILROAD CROSSING
Figure 42-3J

3. Environmental Effects. Analysis of the environmental effects of bicycle accommodations should be accomplished and documented along with the environmental analysis for the associated highway project.

42-3.06 Signing, Marking, and Traffic Control

Pavement marking and signing of bike paths should be in accordance with the *ILMUTCD* and applicable local ordinances.

Bicycle routes should be signed if they meet the following criteria, are continuous, and are at least 1 mi (1.5 km) long:

- The route provides through and direct travel in bicycle-demand corridors.
- The route connects discontinuous segments of shared used paths, bike lanes, and/or other bike routes.
- An effort has been made to adjust traffic control devices (e.g., stop signs, signals) to give greater priority to bicyclists on the route, as opposed to alternative streets. This could include placement of bicycle-sensitive detectors where bicyclists are expected to stop.

- Street parking has been removed or restricted in areas of critical width to provide improved safety.

It may be appropriate to sign shorter bicycle routes if they intersect with another signed bike route.

Pavement marking and signing are especially important at the approaches to intersections and at the end of bike lanes. Where a bike lane ends, bicyclists may be required to merge with motor vehicle traffic. Provide the appropriate striping to encourage lane changes in advance of the intersection. Similar accommodation should be provided whenever a bike lane crosses a highway. Other crossing locations to consider include potential bicycle travel from schools or parks or other significant destinations described in the checklist provided in Section 42-2.

At signalized intersections, bicyclists should be provided an opportunity for a green signal phase. Signal timing usually does not need to be lengthened to allow adequate time for bicycle crossing. The AASHTO *Guide for the Development of Bicycle Facilities* recommends calculating clearance intervals using a bicycle speed of 10 mph (15 km/h) and a perception/reaction/braking time of 2.5 seconds. However, with extremely wide intersections, the designer should provide a median refuge area at least 6 ft (2 m) wide if signal timing would prohibit crossing time. This may be accomplished with timed signals, push-button actuation, or approved detection devices (e.g., infrared, video, sonar, wired detection).

42-4 MAINTENANCE

Responsibility for maintenance of bike lane facilities should be determined and agreed upon during the planning process and should be included in the local agency funding agreement, when applicable.

42-5 REFERENCES

1. *Guide for the Development of Bicycle Facilities*, AASHTO, 1999.

2. Chapter 17, “Bicycle and Pedestrian Accommodation,” *Bureau of Design and Environment Manual*, IDOT.